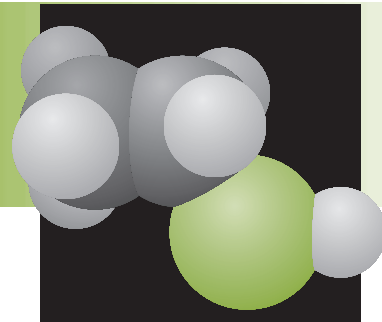


# CHEMICALS

## Project Fact Sheet



## SEPARATION AND RECOVERY OF THERMOPLASTICS FOR REUSE VIA FROTH FLOTATION

### BENEFITS

- Energy savings of more than 95 trillion Btu per year by 2020
- Reduction in waste production of more than 800,000 tons per year by 2020
- Decrease in greenhouse gas emissions of 6.25 pounds of CO<sub>2</sub> per pound of recycled plastic
- Feedstock cost-savings of 60 percent to 80 percent using recycled plastics in place of virgin materials.

### APPLICATIONS

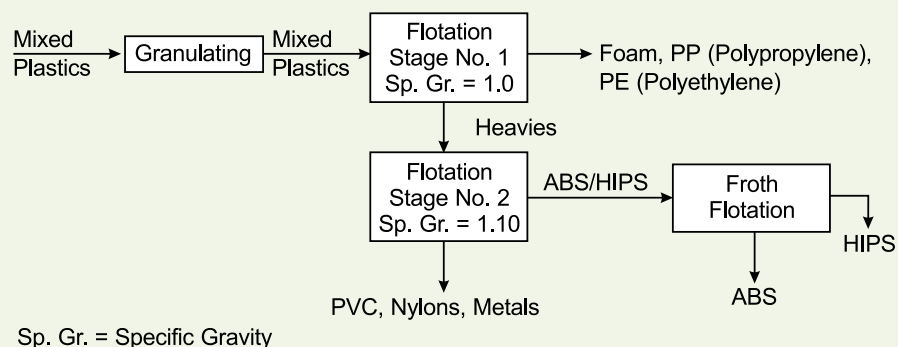
The technology can be applied as a finishing step to conventional separation methods to separate high-value plastics from commingled plastics generated by a manufacturing facility or a durable goods recycler. Acrylonitrile-butadiene-styrene (ABS) and high-impact polystyrene (HIPS) materials can be separated from appliance waste streams and recycled in the manufacture of appliances, automobiles, and electronic goods. Research shows there is potential for using froth flotation to recover plastics from auto shredder residues and other mixed plastic scraps.

### PLASTICS-SEPARATION PROCESS RECOVERS IDENTICAL DENSITY PLASTICS AT HIGH PURITY

High-value plastics are commingled in plastic waste streams. If a technique can be developed to separate the high-value plastics, they can be recycled and reused. Current methods for separating plastics cannot economically remove plastics of identical or similar density from each other. ABS and HIPS plastics are widely used in the manufacture of appliances, automobiles, and electronic goods. When these goods are discarded, they are a major resource for raw materials, and equivalent density plastic materials should be recovered from them.

In bench-scale testing, the froth flotation plastics-separation process has successfully recovered ABS plastics with a purity of more than 99 percent and a yield of higher than 80 percent. There are significant benefits due to lower energy use and resource conservation in the reuse of plastics for industrial manufacturing.

### SEPARATION AND RECOVERY OF THERMOPLASTICS FOR REUSE VIA FROTH FLOTATION



**Recovered high-purity plastics retain their properties which encourages their recycling in high-value applications.**



## Project Description

**Goal:** To demonstrate the froth flotation technique as an innovative and cost-effective separation technology to increase plastics recycling from obsolete appliances and automobiles.

The froth flotation technology uses the surface wetting characteristics of the plastic materials as a basis for separating ABS from HIPS. By adjusting the chemistry of the solution, the surface-wetting characteristics of equivalent-density plastic materials are selectively changed. Small gas bubbles can be attached to one material's surface, reducing its effective density and causing the plastics to float in an appropriate solution.

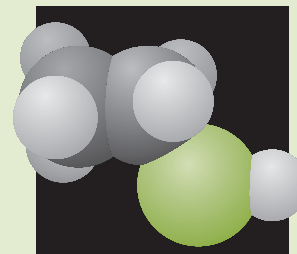
Investigations of the technical and economic performance of the ABS/HIPS separation process are underway at a pilot plant in Minnesota. The unit is operating in both an experimental and semi-production mode to assess process economics; establish product performance; explore marketing opportunities; and develop design, processing, and safety procedures for a commercial operation. Parallel research is also underway in the laboratory to develop froth flotation processes for recovering automotive thermoplastics from auto shredder residues. (These plastics include ABS, PC, ABS/PC, nylons, polyvinylchloride, PE, and PP.) After effective froth solutions are identified, the process will be scaled-up to pilot scale for further evaluation.

## Progress and Milestones

- Specific targets sought at the pilot plant are a product purity of greater than 99 percent, and a process yield of more than 80 percent at a system throughput capacity of greater than 1,000 pounds per hour.
- Since July 1998, ABS material has been separated from more than 3,000 pounds of plastics and shows a purity of greater than 95 percent and a yield of more than 70 percent. Tests are underway to assess the economic and technical performance of the process and the value of the ABS material.
- Pilot plant tests should be completed by October 31, 1999.
- Research to determine froth solutions for recovering selected automotive plastics has identified the ASR plastics of highest economic value, produced concentrated fractions of selected plastics for use in bench-scale testing, and is identifying conditioning agents for potential use in effective froth solutions.

## Patents

Argonne National Laboratory. Method for Separation of High Impact Polystyrene (HIPS) and Acrylonitrile Butadiene Styrene (ABS) Plastics. U.S. Patent 5,653,867.



## PROJECT PARTNERS

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February 1999